DISASTER

Data Interoperability Solution At Stakeholders Emergency Reaction

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Abstract

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Executive summary

This document describes standardisation organisations and standardisation activities and initiatives relevant to the DISASTER project. The document is the second one of a series of three volumes and it must be seen as the extended basis about potential strategic movements for the project as far as standardisation is concerned. This second volume provides a consolidated list of candidates, a description of their activities and feasible ways of collaboration from the project.

Chapter 2 is split into Chapter 2.1, that identifies some pertinent international organisations, such as W3C, OASIS, JoinUp, and some of the Working Groups belonging to these organisations, and Chapter 2.2, devoted to national standardisation organisations, including more organisations, such as British Standards (BSI), two Italian bodies (UNI and CEI), the Greek Elot, the Portuguese IPQ, the French AFNOR and the Spanish AENOR. Finally, Chapter 3 deals with already set-up, tangible activities and initiatives from the DISASTER project point of view.

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Keywords	standardisation, standards, technical committees, standardisation commitees, W3C, OGC, ISO, DIN, DS, NEN, CEN, CENELEC, JoinUP

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Abbreviations

ADMS Asset Description Metadata Schema

CAP Common Alerting Protocol

CEN Comité Européen de Normalisation; in English the European Committee for Standardisation

CENELEC Comité Européen de Normalisation Électrotechnique; in English, the European Committee for Electrotechnical Standardisation

CSAIL Computer Science and Artificial Intelligence Laboratory

DCAT Data Catalog Vocabulary

DIN Deutsches Institut für Normung; in English, the German Institute for Standardisation

DS Dansk Standard, Danmarks nationale standardiseringsorganisation; in English Danish Standards Foundation

EDXL Emergency Data Exchange Language

EMERGEL Emergency Elements

ERCIM European Research Consortium for Informatics and Mathematics

ETSI European Telecommunications Standards Institute

GeoSPARQL Geographic SPARQL Protocol and RDF Query Language

GML Geography Markup Language

HTTP Hypertext Transfer Protocol

IETF Internet Engineering Task Force

IRI Internationalised Resource Identifier

ISA Interoperability Solutions for Public Administrations

KML Keyhole Markup Language

KMS Kort & Matrikelstyrelsen; in English, (the Danish) National Survey and Cadastre

NEN Nederlands Normalisatie-instituut; in English, the Netherlands Standardization Institute

OASIS Organization for the Advancement of Structured Information Standards

OGC Open Geospatial Consortium

OWL Web Ontology Language

PURL Persistent Uniform Resource Locators

RADion Repository Asset Distribution

RDF Resource Description Framework

SLD Styled Layer Descriptor

URI Uniform Resource Identifier

W3C World Wide Web Consortium

WFS Web Feature Service

WMS Web Map Service

XML eXtensible Markup Language

Chapter 1

Introduction

This second deliverable volume devoted to standardisation consolidates the first steps carried out in the first volume concerning standardisation process, that were namely, identifying potential experts and communities, and describe the status of the first efforts to align the project to the potentially interesting ones.

In this second volume the focus is put not only on the identification and description of organisations but also on collaboration initiatives, analysis of potential opportunities and activities already in force. Some standardisation activities have been already launched, as it is described in Section 3, one has to do with the incorporation of the DISASTER ontology, EMERGEL, to the framework provided by the European JoinUp platform and with the collaboration with the W3C's Government Linked Data working group. Another one is a possible collaboration with a working group established by DIN, the German Institute for Standardisation. Dialogue with the group is in its early stages and work is ongoing to obtain clarification and ensure their focus is in line with the DISASTER project.

Chapter 2

Standardisation organisations, working groups and technical committees

In this Section we present a number of interesting organisations, working groups and technical committees dealing with technical standardisation initiatives mainly in the context of emergency management but also regarding spatial data formalisation.

A description of each organisation is provided along with a brief account highlighting any working groups and technical committees they manage that may be of interest to the DISASTER project. Finally, and when possible, some strategic lines of possible collaboration by the DISASTER project are provided.

2.1 International organisations

This section is devoted only to international organisations. It includes a high-level summary of their activity and connexion with the crisis management environment and other interesting aspects with respect to standardisation.

2.1.1 W3C

The World Wide Web Consortium (W3C) is an international consortium gathering together member organisations that work to develop standards for the Web since 1994. W3C operations are administered by a number of actors who work together, namely the MIT Computer Science and Artificial Intelligence Laboratory (CSAIL) in the USA, the European Research Consortium for Informatics and Mathematics (ERCIM) headquartered in France and Keio University in Japan. W3C also has offices around the world, including a Spanish office at Fundación CTIC, a member of the DISASTER consortium.

The most well-known standard produced by W3C is the HyperText Markup Language (HTML), the standard language for the markup of Web pages. W3C has been involved and still is in the development of the Internet Engineering Task Force (IETF) standards HTTP (Hypertext Transfer Protocol), URI (Uniform Resource Identifier), and IRI (Internationalised Resource Identifier),

which are used for addressing and transferring content on the Web. Furthermore, the W3C has produced a range of standards in areas such as accessibility, internationalisation, privacy, and Web services. Three standards that are relevant for DISASTER are the eXtensible Markup Language (XML), which is a language for exchanging (semi-)structured data; XML Schema, which is a language for describing the structure of XML documents, and RDF, a standard model for data interchange on the Web allowing structured and semi-structured data to be mixed, exposed, and shared across different applications. All three languages are frequently used in emergency and security information data exchange services.

It seems of particular interest for DISASTER the activities of the W3C in the Semantic Web field[1]. The Semantic Web provides a framework that allows data to be shared and reused across application, enterprise, and community boundaries. This framework includes languages for representing and interchanging data, ontologies, etc., as the aforementioned RDF, but also the Web Ontology Language OWL[2], that extends RDF Schema with a number of features to make it a more expressive ontology language. It is considered the standard language for representing ontologies.

Concerning the domain of emergency management, the W3C had an interesting working group from 2005 to 2009: The Emergency Information Interoperability Framework Incubator Group[3]. It was later closed, but it seems that it managed to create a community of experts that could be potentially interested in developing new initiatives related to the topic.

Currently, a group of interest for the DISASTER project is the Government Linked Data Working Group[4]. We have already made contacts with them and the possible ways of collaboration are described in Section 3.1.

2.1.2 OASIS

The Organization for the Advancement of Structured Information Standards (OASIS)[5] is a global consortium based in the United States that drives the development, convergence, and adoption of e-business and web service standards. Members of the consortium decide how and what work is undertaken through an open process.

OASIS promotes industry consensus and produces worldwide standards for several domains such as security, Cloud computing, SOA, Web services, the Smart Grid, electronic publishing, emergency management, etc.

OASIS members broadly represent both the public and the private sectors and not only technology leaders but also users and influencers. The consortium has more than 5,000 participants representing over 600 organizations and individual members in 100 countries.

As far as the topics of the DISASTER project are concerned, OASIS are responsible for the development of the Common Alerting Protocol (CAP), an XML-based data format for exchanging public warnings and emergencies between alerting technologies, or the Emergency Data Exchange Language (EDXL), suite of XML-based messaging standards that facilitate emergency informa-

[1] http://www.w3.org/sw/
[2] http://www.w3.org/OWL/
[3] http://www.w3.org/2005/Incubator/eiif/
[4] http://www.w3.org/2011/gld/wiki/Main_Page
[5] https://www.oasis-open.org/

tion sharing between government entities and the full range of emergency-related organisations.

There is an OASIS Technical Committee, the Emergency Management TC[6] whose motto is "Enabling information exchange to advance incident preparedness and response to emergency situations" that seems pertinent for the DISASTER project.

2.1.3 OGC

The Open Geospatial Consortium (OGC)[7] is an international voluntary consensus standards organisation, originated in 1994. In the OGC, more than 400 commercial, governmental, nonprofit and research organisations worldwide collaborate in a consensus process encouraging development and implementation of open standards for geospatial content and services, GIS data processing and data sharing. The OGC Standards search for supporting interoperable solutions that make the Web more "geo-usable".

They are responsible for the GML (Geography Markup Language), an XML-format for geographical information; KML (Keyhole Markup Language), an XML-based language schema for expressing geographic annotation and visualization on existing (or future) Web-based, two-dimensional maps and three-dimensional Earth browsers; WFS (Web Feature Service) for retrieving or altering feature descriptions; WMS (Web Map Service) to provide map images; GeoSPARQL (Geographic SPARQL Protocol and RDF Query Language) representation and querying of geospatial data for the Semantic Web; or SLD (Styled Layer Descriptor) an XML schema for describing the appearance of map layers.

To participate in OGC initiatives a membership is required.

2.1.4 Joinup

JoinUp[8] is a new collaborative platform created by the European Commission and funded by the European Union through the Interoperability Solutions for Public Administrations (ISA)[9] Programme. It offers a new set of services to help e-Government professionals share their experience with interoperability solutions and support them to find, choose, re-use, develop, and implement open source software and semantic interoperability assets. JoinUp involves interoperability professionals from all over Europe. Professionals from other countries outside the EU are also welcome to join. JoinUp offers relevant content and insight in various areas of interest, including among others:

- Cross-border and cross-sector interactions between public administrations;
- Pan-European electronic public services;
- Legal information on usage and development of open-source software within public administrations;

[6] https://www.oasis-open.org/committees/tc_home.php?wg_abbrev=emergency
[7] http://www.opengeospatial.org/
[8] http://joinup.ec.europa.eu/page/about_us
[9] http://ec.europa.eu/isa/

- Interoperability impact of EU regulations and actions;
- Access to a repository of reusable semantic assets;
- Methodologies and practice aids on the development of semantic interoperability assets;
- Pan-European e-Government projects.

Although the JoinUp platform seems more oriented to bureaucratic and administrative initiatives, in the context of the DISASTER project several administrative issues are pertinent as well as the reuse of pan-European semantic assets between partners. In addition, one of the plans of the project was to actively collaborate and share the DISASTER ontology with this platform even looking for hosting the vocabulary.

2.1.5 ISO

The International Organisation for Standardisation, known as ISO[10], is an international standard-setting association composed of representatives from various national standards organisations. ISO is in fact a network of national standards bodies. These national standards bodies make up the ISO membership and they represent ISO in their country, as it is the case of the German DIN, presented in Section 2.2.1, the Danish DS, presented in Section 2.2.2, or NEN , presented in Section 2.2.3). ISO promotes worldwide proprietary, industrial, and commercial standards.

Since 1947, ISO has published over 19,000 International Standards covering almost all aspects of technology and manufacturing. ISO has members from 164 countries and 3,335 technical bodies to take care of standard development.

ISO standards are developed through a consensus process by the interested parties that need them. Experts from all over the world develop the standards that are required by their sector, reflecting that way a wealthiness of international experience and knowledge.

Related to the DISASTER topics we have identified a specific ISO 14001, dealing with emergency, preparedness and response, but the opportunities here for DISASTER could come from some efforts to collaborate with national members of the ISO consortium. In Section 3.4, we describe early contacts we have already made in that sense.

2.1.6 CEN

CEN[11], the European Committee for Standardisation (Comité Européen de Normalisation, Europäisches Komitee für Normung), is an international non-profit organisation set up under Belgian law. It provides a platform for the development of European Standards (ENs) and other consensus documents. CEN owns 33 European National Members working together to develop these publications in a large number of sectors to help build the European internal market in goods and services, removing barriers to trade and strengthening Europe's position in the global economy. More than 60.000 technical experts from industry, associations, public administrations, academia, and societal organisations are involved in the CEN network that reaches over 600 million people.

[10] www.iso.org/
[11] http://www.cen.eu/cen/AboutUs/WhatisCEN/Pages/default.aspx

The European Commission and the EFTA (European Free Trade Association) Secretariat act as CEN's Counsellors in terms of regulatory or public interest.

CEN works in a decentralised way. Its members the National Standardisation Bodies (NSBs) of the EU and EFTA countries operate the technical groups that draw up the standards; the CEN-CENELEC Management Centre (CCMC) in Brussels manages and coordinates this system.

A possible opportunity for DISASTER could be the CEN Workshop Agreements, that offer a possibility to create pre-standard documents for the community in a shorter time (10-12 month) than a full standardisation process.

Section 3.4 also presents early conversations about potential collaboration with CEN through a DIN working group.

2.1.7 CENELEC

CENELEC[12] is the European Committee for Electrotechnical Standardisation and is responsible for standardisation in the electrotechnical engineering field. CENELEC prepares voluntary standards, which help facilitate trade between countries, create new markets, cut compliance costs and support the development of a Single European Market.

CENELEC creates market access at European level but also at international level, adopting international standards wherever possible, through its close collaboration with the International Electrotechnical Commission (IEC), under the Dresden Agreement.

In an ever more global economy, CENELEC fosters innovation and competitiveness, making technology available industry-wide through the production of voluntary standards.

Through the work of its members together with its experts, the industry federations and consumers, European Standards are created in order to encourage technological development, to ensure interoperability and to guarantee the safety and health of consumers and provide environmental protection.

Designated as a European Standards Organisation by the European Commission, CENELEC is a non-profit technical organisation set up under Belgian law. It was created in 1973 as a result of the merger of two previous European organisations: CENELCOM and CENEL. But Although CENELEC works closely with the European Union, it is not an EU institution.

2.2 National organisations

This section is devoted only to national organisations. It includes a high-level summary of their activity with relevant standardisation initiatives at a national level, provinding also their connexion from national to international level as members of the ISO consortium.

[12] http://www.cenelec.eu/aboutcenelec/whoweare/index.html

2.2.1 DIN

Deutsches Institut für Normung (DIN; in English, the German Institute for Standardisation)[13] is the German national organisation for standardisation and is Germany ISO member body. DIN is a non-governmental organisation recognised by the German government as the national standards body and represents German interests at international and European level.

DIN Standards promote rationalisation, quality assurance, safety, and environmental protection as well as improving communication between industry, technology, science, government and the public domain. The standardisation works are carried out by 26,000 external experts serving as voluntary delegates in more than 4,000 committees. Draft standards are submitted and available for public comment, and all comments are reviewed before final publication of the standard. Published standards are reviewed for continuing relevance every five years, at least.

The over 12,000 DIN standards cover a wide range of topics including: physical quantities and units, fasteners, water analysis, building and civil engineering (including building materials, construction contract procedures (VOB), soil testing, corrosion protection of steel structures), materials testing (testing machines, plastics, rubber, petroleum products, semiconductors), steel pipes, machine tools, twist drills, roller and ball bearings, and process engineering. DIN Handbooks (covering subjects such as mechanical engineering, fasteners, steel, welding, etc.). Most DIN standards are available in English versions, or in English translations.

Standards are produced in collaboration with all interested entities on request of a specific entity or group, and it demands consensus among the collaborating entities.

2.2.2 DS

Danish Standards[14] is a private independent organisation whose profits are reinvested into the development of new activities for the benefit of society and the corporate sector. Their primary fields of activity include standardisation, consultancy, sale of standards and handbooks, courses and conferences and ecolabelling. DS is Denmark representant in the ISO organisation.

They offer certification through their subsidiary DS Certificering A/S. Within their core activity standardisation, Danish Standards concludes a performance contract with the Ministry for Economic and Business Affairs.

2.2.3 NEN

The Netherlands Standardisation Institute (NEN)[15] is a private, non-profit organisation. It operates since 1916, when it was set up by the Netherlands Society for Industry and Trade, in cooperation with the Royal Institute of Engineers. It is that country's ISO member body.

NEN searches for assuring an active involvement of the trade and industry sectors in the Netherlands in the development of international, European standards and also of national standards. It also promotes the use of standards and standardisation within the Netherlands, being that country's

[13] http://www.din.de/cmd?level=tpl-home&languageid=en
[14] www.ds.dk/en/
[15] http://www.nen.nl/

ISO member body and so the organisation to be contacted there for information on standards and standards development.

The NEN bureau is an integrated organisation that works together with both the Netherlands Standardisation Institute and the Netherlands Electrotechnical Committee.

2.2.4 GEONOVUM

Geonovum[16] is the National Spatial Data Infrastructure (NSDI) executive committee in the Netherlands. The organisation devotes itself to providing better access to geo-information in the public sector. Geonovum develops and manages the geo-standards needed to implement this goal, connecting public sector managers with the workfloor professionals, making possible the national geoinformation infrastructure.

Geonovum is a small and flexible organisation whose activities are subsidised by the Ministries of Infrastructure and Environment (IenM), Economy, Agriculture and Innovation (EL&I), the land registry (Kadaster) and TNO.

Geonovum's main goals are to develop and standardise the geo-information infrastructure while also being innovative; to build up and disseminate knowledge in the area of geo-information infrastructure; to make the geo-information infrastructure more accessible to administrative bodies, institutions and departments in the Netherlands and the European Union. In order to reach its goals Geonovum devotes itself to the following labours:

- to share and make accessible all the geo-information available in the Netherlands;
- to be a think tank in the domain of geo-information;
- to be the 'voice of geo-information' that provides the minister of I&M and the Council for Geo-information with professional advice and relevant knowledge.
- to develop high-quality and widely applicable standards and to monitor their use.

The tasks focus in particular on developing and controlling standards, making up-to-date geo-information accessible, developing knowledge and giving advice to the Council for Geo-information on technology and implementation aspects. Geonovum does not carry out all its tasks itself but calls in third-party help where needed.

2.2.5 BSI

BSI Group or the British Standards Institution (BSI)[17], is a non-profit distributing incorporated body and a multinational business services provider whose principal activity is the production of standards and the supply of standards-related services.

The main objective of the BSI is to set up standards of quality for goods and services, and to prepare and promote the general adoption of British Standards. BSI produces standards on a

[16] http://www.geonovum.nl/
[17] www.bsigroup.com

wide range of products, services and processes; from sustainability to risk, business continuity management and nanotechnology.

BSI represents the UK both at European (CEN, CELENEC) and international (ISO) levels.

2.2.6 UNI

The Ente nazionale italiano di unificazione (UNI)[18] is a private, non-profit organisation that develops its standard-setting activities in the industrial, commercial and tertiary sectors. The UNI participates as the partner representing Italy in the international organisations ISO and CEN (Section 2.1.5 and Section 2.1.6 respectively). It excludes from its target the electrotechnical and electronic sectors, that are addressed by the CEI (see Section 2.2.7).

The UNI was constituted in 1921 initially to deal exclusively with the mechanical industry but from 1928 it extended its domain to all the industrial sectors.

The main roles of the UNI are:

- to elaborate new standards in collaboration with all the interested parts;
- to represent Italy within the international activities at worldwide level (ISO) and at European level (CEN) with the aim of promoting the harmonisation of the standards;
- to publish and disseminate the technical standards and the related editorial documents.

Among the Italian organisations federated to the UNI, there are the CTI (Comitato termotecnico italiano energia e ambiente), dealing with energy and environmental issues, and the Comitato italiano gas (CIG), dealing with the standard activity of the gas sector.

2.2.7 CEI

The Comitato elettrotecnico italiano (CEI)[19] is an Italian organisation founded in 1909 focusing on standardisation activities and dissemination within the electrotechnical and electronic sectors. Besides working on the elaboration of new standards, the CEI also publishes and disseminates standardisation documents and it is the Italian representant in the European organisation CELENEC (see Section **??**) and in the international ISO.

2.2.8 ELOT

The Hellenic Organisation for Standardization (ELOT)[20] is a non-profit body established in 1976. It depends on Greece's Ministers of Industry and Development.

[18] www.uni.com
[19] www.ceiweb.it
[20] www.elot.gr

As organisation, ELOT works on the development, the promotion and the implementation of standardization in Greece, and some of its main activities have to do with elaborating and disseminating standards, certification of both products and management systems, inspections, training and publication of standards and technical regulations.

2.2.9 IPQ

The Instituto Português da Qualidade (IPQ)[21] is the Portuguese national body in charge of managing and developing the legal framework for quality matters in Portugal. It deals as well with official certifications of products, company quality systems and accreditation of entities in this domain.

The IPQ is the Portuguese representative body in the quality field at international level (ISO), and at the European one (CEN).

2.2.10 AFNOR

The Association Française de Normalisation (AFNOR)[22] is the French national organisation in charge of standardisation and its ISO member body. The AFNOR Group develops its international standardisation activities, information provision, certification and training through a network of different key partners in France who are members of the association.

2.2.11 AENOR

The Asociación Española de Normalización y Certificación (AENOR)[23] is a private non-profit organisation that was founded in 1986. Its activity contributes to improving the quality and competitiveness of companies, their products and services.

2.3 Other organisations or initiatives

Regarding standardisation, there are also other initiatives, both in the national level and in the European one, that if they do not have room in the main sections of this deliverable they are worth mentioning and deserve some attention.

In Denmark there is a government firm called KMS[24] (Kort & Matrikelstyrelsen; in English, National Survey and Cadastre) that is looking for standardisation initiatives on GIS information. It seems they have not yet developed a working group for the moment, but it could be interesting to monitor them having in mind second developments of this deliverable.

The GMES Emergency Management Service[25] is a set of services funded by the European Comission. They started operations on April 1st, 2012 and their services are aimed at providing actors in

[21] www.ipq.pt
[22] www.afnor.org
[23] www.aenor.es
[24] http://www.kms.dk/English/
[25] http://portal.ems-gmes.eu/

the management of natural and man-made disasters, in particular Civil Protection Authorities and Humanitarian Aid actors with mapping products based on satellite imagery (EMS - Mapping).

Chapter 3

Standardisation efforts

3.1 Efforts related to the W3C and the JoinUp platform

One of the DISASTER project results is the creation of the ontology EMERGEL (Emergency Elements), which status has already reached the publication of its core module and a first version of its vertical modules. In this context, the DISASTER project has already made initial contacts with the W3C consortium, in particular with the Government Linked Data Working Group[1], to draw attention from the community having in mind that the aim of EMERGEL is to go beyond the DISASTER project life and to reach a standard-like condition. In this Working Group there is also presence from the European JoinUp initiative (see Section 2.1.4), a platform caring about the standardisation of open vocabularies and models, and open source software within the European Union. The first reaction has been positive, although it may take some time to formalise the relationship and to agree about the publication procedure of the DISASTER ontology, EMERGEL.

EMERGEL has been already conceived to be aligned with some of the upper-level government-ground vocabularies designed by the W3C consortium and the JoinUP platform. These vocabularies play two roles with respect to EMERGEL. On the one hand, they allow EMERGEL to incorporate into a general description framework of standardise vocabularies at the European (even international) level. On the other hand, their top-level structure enables domain-specific classifications and vocabularies (vertical modules) to be connected and integrated in the single semantic space of EMERGEL. These vocabularies are the following:

- RADion (Repository Asset Distribution)[2]: a high-level vocabulary intended to facilitate the federation and co-operation of semantic assets repositories. It aims to act as a common layer among repositories that want to exchange data.
- DCAT (Data Catalog Vocabulary)[3]: an RDF Schema vocabulary for metadata about structured data resources, such as datasets or catalogs.
- ADMS (Asset Description Metadata Schema)[4]: is an OWL vocabulary to describe semantic

[1] http://www.w3.org/2011/gld/wiki/Main_Page
[2] http://www.w3.org/ns/radion
[3] http://www.w3.org/TR/vocab-dcat//
[4] http://www.w3.org/ns/adms

assets and their repositories. It has been specially designed to favour SKOS taxonomies and classifications reusage.

It is worth noting that EMERGEL embracing of these initiatives permits it to be a consortium-open product, leaving the door open to and welcoming future third-party extensions and contributions.

However, while the incorporation of EMERGEL to that framework is prepared, the early version of the ontology will keep a namespace that has been registered at PURL, a service providing Web addresses that act as permanent identifiers in the face of a dynamic and changing Web infrastructure. This allows the underlying Web address of resources to change over time without negatively affecting systems that depend on them. A PURL namespace was registered as http://purl.org/emergel. The ontology will be hosted by CTIC in http://vocab.ctic.es and will be published according to W3C best practices[5].

3.2 EMERGEL and the W3C Government linked data working group

The EMERGEL ontology is planned to be officially introduced to the W3C Government linked data (GLD) Working Group. Some members of this working group were already aware of the existence of the ontology, but no official presentation had been carried out so far.

At the time of this writing the last steps regarding the vertical modules modelling are being addressed and once this will be achieved, some members of the DISASTER project will try to find an opportunity in January or February 2014 to present to the working group both the core and the vertical modules of the EMERGEL ontology, possibly in the context of the activities writing Best Practices for Publishing Linked Data.

3.3 EMERGEL vertical modules and standardisation

The population of the EMERGEL vertical modules includes several classifications, thesauri, lists and other controlled vocabularies that have been adapted and transformed into RDF format as instances of the different concept schemes defined by the initial modelling.

The source of these classifications and vocabularies has been carefully selected always as open and free of use, mostly coming from Wikipedia (about 85-90%) or from other public and freely usable resources available at different websites.

In the following subsections we present a list of vocabularies included so far within the EMERGEL vertical modules.

3.3.1 Vehicles, airports, countries, flying international regions (FIR) and code designators

The EMERGEL vertical modules include the following classifications or lists that populate the corresponding concept schemas of *Vehicles* and *Places*:

[5] http://www.w3.org/TR/2008/WD-swbp-vocab-pub-20080123/

- **Aircrafts** (1707 instances): this list encompasses all the (manned) aircrafts that are currently operative (both military or civil). Each model is mapped to the Manufacturer subclass within the Companies class. It was obtained from ICAO aircraft codes available in Wikipedia (cited further on), as consulted in March 2013. **Mappings**: they are mapped to the IATA aircraft designators and ICAO aircraft designators.
- **Helicopters** (154 instances): a subdivision of the latter, this list only includes the helicopters that are currently operative (both military or civil). It was obtained manually from the previous one. **Mappings**: they are mapped to the IATA aircraft designators and ICAO aircraft designators.
- **IATA aircraft designators** (325 instances): the codes used by IATA to identify aircrafts. They are trigram letter/digit codes used for aircraft models. It was taken from the corresponding Wikipedia article[6], as consulted in March 2013. **Mappings**: they are mapped to the list of aircrafts and to the ICAO aircraft designators.
- **ICAO aircraft designators** (1197 instances): the codes used by ICAO to identify aircrafts. They are a three- or four-character alphanumeric code designating every aircraft type (and some sub-types) that may appear in flight planning. The list was obtained from the corresponding Wikipedia article[7], as consulted in March 2013. **Mappings**: they are mapped to the list of aircrafts. Mappings: they are mapped to the list of aircrafts and to the IATA aircraft designators.
- **ICAO helicopter designators** (75 instances): the codes used by ICAO to identify rotorcrafts. They are a three- or four-character alphanumeric code designating every rotorcraft type (and some sub-types) that may appear in flight planning. The list was manually obtained from the previous aircrafts one by splitting the helicopters. **Mappings**: they are mapped to the ICAO aircraft designators and to the ICAO aircraft designators.
- **Countries** (254 instances): a list of countries according to ISO. The list was obtained from tables available in the Wikipedia[8], as consulted in March 2013. **Mappings**: they are mapped to the ICAO country designators, to the IATA country designators, to the list of airports, to the ICAO flying international regions and to the ICAO FIR designators.
- **UIC country designators**: the codes used by Union Internationale des Chemins de fer (UIC) to identify countries. **Mappings**: they are mapped to the country list and to the ISO country designators.
- **IATA country designators** (252 instances): the codes used by IATA to identify countries (based upon the ISO country codes aforementioned). **Mappings**: they are mapped to the list of countries, to the ICAO country designators, to the list of airports, to the ICAO flying international regions and to the ICAO FIR designators.
- **ICAO flying international regions (FIR)** (244 instances): the list of International flying regions according to ICA. They were obtained from the Wikipedia article[9] dedicated to

[6] https://en.wikipedia.org/wiki/IATA_aircraft_type_designator/
[7] https://en.wikipedia.org/wiki/List_of_ICAO_aircraft_type_designators
[8] https://en.wikipedia.org/wiki/ISO_3166-1_alpha-2
[9] https://en.wikipedia.org/wiki/International_Civil_Aviation_Organization_airport_code#Prefixes

the ICAO airport codes (as consulted in March 2013), but just extracting the prefixes that identify the regions. **Mappings**: they are mapped to the ICAO FIR designators.

- **ICAO FIR designators** (244 instances): the ICAO codes identifying the corresponding international flying regions presented in the previous category. **Mappings**: they are mapped to the ICAO flying international regions.
- **Airports** (7717 instances): the list of airports was automatically retrieved from the matching between the ICAO and IATA airports designators. **Mappings**: they are mapped to the ICAO airport designators, to the IATA airport designators, to the ICAO flying international regions, to the ICAO FIR designators, to the list of countries and to the IATA and ICAO country designators.
- **ICAO airport designators** (6481 instances): a four-character alphanumeric code designating each airport around the world according to the International Civil Aviation Organization (ICAO). The list is taken from the corresponding Wikipedia article[10], as consulted in March 2013. **Mappings**: they are mapped to the IATA airport designators, to the ICAO flying international regions, to the ICAO FIR designators, to the list of countries and to the IATA and ICAO country designators.
- **IATA airport designators** (7774 instances): also known as IATA location identifiers, IATA station codes or simply a location identifier, it is a three-letter code designating many airports around the world. They were taken from the corresponding Wikipedia article[11], as consulted in March 2013. **Mappings**: they are mapped to the ICAO airport designators, to the ICAO flying international regions, to the ICAO FIR designators, to the list of countries and to the IATA and ICAO country designators.
- **UIC country designators**: the codes used by Union Internationale des Chemins de fer (UIC) to identify countries. **Mappings**: they are mapped to the country list and to the ISO country designators.

3.3.2 Companies

The EMERGEL vertical modules include as well the following classifications or lists that populate the corresponding concept scheme of *Companies*:

- **Airlines** (5531 instances): The list of airlines was obtained from the Wikipedia[12] as consulted in March 2013.
- **Airplane and helicopter manufacturers** (262 instances): the list was automatically extracted from the one provided in the previous Airline list, focusing just on the manufacturer of the model and omitting the aircraft model.
- **IATA airline designators** (994 instances): the codes used by IATA to identify airlines and similar air companies. The list was taken from the corresponding Wikipedia article[13].

[10] https://en.wikipedia.org/wiki/List_of_airports_by_ICAO_code
[11] https://en.wikipedia.org/wiki/IATA_airport_code
[12] https://en.wikipedia.org/wiki/List_of_airlines
[13] https://en.wikipedia.org/wiki/IATA_airline_designator

- **ICAO airline designators** (5530 instances): the codes used by ICAO to identify airlines and similar air companies.
- **ICAO call signs**: common reference name for airlines to be used by operators. For instance, Murman is the call sign for the Murmansk Aviation Enterprise, LLC. These call signs do not appear in EMERGEL as a list, but as a property of each individual airline.
- **Cruise lines** (93 instances): a list of cruise lines extracted from the corresponding Wikipedia article[14] (as consulted in March 2013).
- **Regular service passenger ship companies** (196 instances): this list gathers together ferry operators and other service for passengers different from the cruise lines. It comes from the corresponding Wikipedia article[15] (as consulted in March 2013).
- **General freight ship companies** (198 instances): a general list of freight ship companies coming from the corresponding Wikipedia article[16] (as consulted in March 2013).

3.3.3 Dangerous goods classifications

The EMERGEL vertical modules also includethe following classifications or lists that populate the corresponding concept scheme of *Dangerous goods*:

- **UN numbers for hazardous substances** (2312 instances): these UN IDs are the mother lode of the Dangerous goods class within the EMERGEL vertical modules and around this lode, EMERGEL builds mappings from them to the HAZMAT classes and from there to the ADR, CHIP, CLP/GHS and IMDG pictograms and hazards. The exhaustive list of UN numbers available within the EMERGEL vertical modules was carefully imported from the corresponding Wikipedia article[17] (as consulted in March 2013), from where other linguistic versions were as well added. **Mappings**: they are mapped to the HAZMAT classes and, by means of these mappings, it is possible to reach the general pictograms of ADR, CHIP, IMDG, CLP/GHS and DIN 4844-2.
- **HAZMAT classes** (24 instances): following the UN Model, hazardous materials are divided into nine classes, some of which are further subdivided. Hazardous materials in transportation must be placarded and have specified packaging and labelling. Some materials must always be placarded, others may only require placarding in certain circumstances. This classification was taken from the corresponding Wikipedia article[18] (as consulted in March 2013). **Mappings**: they are mapped to the UN numbers and to the ADR, CHIP, IMDG, CLP/GHS and DIN 4844-2 corresponding pictograms.
- **ADR** (European Agreement concerning the international carriage of dangerous goods by road) supplies pictograms to label the dangerous goods during the transportation:

[14] https://en.wikipedia.org/wiki/List_of_cruise_lines
[15] https://en.wikipedia.org/wiki/List_of_passenger_ship_companies
[16] https://en.wikipedia.org/wiki/List_of_freight_ship_companies
[17] https://en.wikipedia.org/wiki/List_of_UN_numbers
[18] https://en.wikipedia.org/wiki/Portal:Hazardous_Materials

  - **ADR hazards as pictograms** (29 instances): the description and classification of the hazards were taken from the corresponding Wikimedia article[19] (as consulted in March 2013). **Mappings**: they are mapped to the CHIP, CLP/GHS, IMDG and DIN 4844-2 ones.
  - **ADR pictogram codes** (24 instances): these codes were taken from the previously mentioned Wikipedia article. **Mappings**: they are mapped to the ADR hazards and, through them, to the CHIP, CLP/GHS, IMDG and DIN 4844-2 equivalents.

- **CHIP** (Chemicals Hazard Information and Packaging for supply), this classification is currently deprecated but may still be seen in some vehicles not yet updated:

  - **CHIP hazards as pictograms** (10 instances): the list of pictograms are noted in EMERGEL as deprecated, but nonetheless they are mapped to their CLP/GHS equivalent that are currently in use and to the DIN 4844-2 equivalents as well. They are taken from the corresponding Wikipedia article[20] (as consulted in March 2013). **Mappings**: they are mapped to the CLP/GHS, ADR, IMDG and DIN 4844-2 ones.
  - **CHIP pictogram codes** (10 instances): taken from the previously mentioned Wikipedia article. **Mappings**: they are mapped to the CHIP hazards and, through them, to the CLP/GHS, ADR, IMDG and DIN 4844-2 equivalents.

- **CLP/GHS** (Classification, Labelling and Packaging / Globally Harmonised System of classification and labelling of chemicals):

  - **CLP/GHS hazards as pictograms** (9 instances): they have taken over their deprecated CHIP equivalents presented in the previous subsection. The source of this list is the corresponding Wikipedia article[21] (as consulted in March 2013). **Mappings**: they are mapped to the CHIP, ADR, IMDG and DIN 4844-2 ones.
  - **CLP/GHS pictogram codes** (9 instances): taken from the previously mentioned Wikipedia article. **Mappings**: they are mapped to the CLP/GHS hazards and, through them, to the ADR, CHIP, IMDG and DIN 4844-2 equivalents.

- **German standard DIN 4844-2**:

  - **DIN 4844-2 hazards**: the list if provided with labels both in German and English, and is taken from the corresponding Wikipedia article[22] (as consulted in March 2013). **Mappings**: Some of the pictograms come with mappings to their equivalents in ADR, CHIP and CLP/GHS.
  - **DIN 4844-2 pictogram codes**: taken from the previously mentioned Wikipedia article. **Mappings**: they are mapped to the DIN 4844-2 hazards and, through them, to the ADR, CHIP, CLP/GHS and IMDG equivalents.

- **IMDG** (International Maritime Dangerous Goods):

[19] https://commons.wikimedia.org/wiki/ADR_labels_of_danger
[20] https://en.wikipedia.org/wiki/European_hazard_symbols
[21] https://en.wikipedia.org/wiki/GHS_hazard_pictograms
[22] https://de.wikipedia.org/wiki/Warnzeichen

- **IMDG hazards as pictograms** (1 instance): this pictogram (a crossed fish) is deprecated and has been substituted by the corresponding GHS one (environmental), but it may be still found sometimes in old containers not yet updated concerning labels. **Mappings**: this deprecated pictogram is mapped to the valid in force equivalent one in CLP/GHS and ADR.
- **IMDG Marine pollutants** (488 instances): the list of marine pollutants identified by the IMDG. It is taken from the U.S. Government Printing Office website[23], which license explicitely allows to make freely use of the data[24].
- **IMDG pictogram codes** (1 instance): the code of that deprecated pictogram aforementioned.

- **Others**:

  - **Explosives compatibility groups** (13 instances): this list of compatibility groups are connected to the HAZMAT class 1 (explosives) and provides details and cautions about the storage of the different explosive divisions. More specifically, the compatibility group suffix describes which types of product may inhabit the same means of containment. They were taken from the corresponding Wikipedia article[25] (as consulted in March 2013). **Mappings**: as already mentioned, these compatibility groups are mapped to the HAZMAT class 1 and to its divisions, that mapped as well to the UN numbers.
  - **o IATA handling codes** (112 instances): Among the different IATA codes, there are also some referring to goods and their handling cautions. **Mappings**: EMERGEL maps these IATA codes to the corresponding HAZMAT classes, divisions and transportation symbols.
  - **Radionuclides** (765 instances): Radionuclides are atoms with an unstable nucleus undergoing radioactive decay that results in the emission of gamma ray(s) and/or subatomic particles such as alpha or beta particles. Radionuclides occur naturally or can be produced artificially. The list included within the EMERGEL vertical modules is taken from the corresponding Wikipedia article[26]. **Mappings**: in EMERGEL, they are mapped to the corresponding HAZMAT class 7 and, by means of these mappings it is possible to reach the corresponding UN numbers.

As these classifications and vocabularies have been converted to SKOS, the W3C recommendation for controlled vocabularies, and they have been enriched by including mappings between several ones among them, they can be deemed as potentially interesting added-value semantic assets to be standardised. This could be carried out through the already mentioned EU JoinUP platform or through other means.

[23] http://www.gpo.gov/fdsys/granule/CFR-2000-title49-vol2/CFR-2000-title49-vol2-sec172-101-appB/content-detail.html

[24] http://www.gpo.gov/fdsys/bulkdata/CFR/resources/CFR-XML_User-Guide_v1.pdf

[25] https://en.wikipedia.org/wiki/Explosives_shipping_classification_system

[26] https://en.wikipedia.org/wiki/Radionuclide#List_of_commercially_available_radionuclides

3.3.4 datahub

One interesting portal "to get, use and share data" is datahub[27], where users and organisations make publicly available the data produced by linking them to the catalogue provided by the portal.

datahub offers fora for users to ask for theme data of any imaginable domain and it is not unreasonable to assume that there are users interested in the data belonging to the EMERGEL vertical modules presented in the last sections.

We have already signed up to this portal in order to share the data included in the EMERGEL ontology.

3.4 Other standardisation efforts

Another possible collaboration initiative regarding standardisation could be with DIN's (see Section 2.2.1) SPEC 91287[28] development group, interested in collaboration and working on international interoperability standards for EMS data exchange.

During a national/EU security research conference in Brussels, one of the DISASTER project partners, antwortING, made some contacts with people responsible for the DIN SPEC and obtained some feedback and predisposition for cooperating. It was suggested to use the CEN (see Section 2.1.6) Workshop Agreement for standardisation activities in EU research projects.

[27] www.datahub.io

[28] http://www.spec.din.de/cmd?level=tpl-art-detailansicht&committeeid=0&artid=152988042&bcrumblevel=2&languageid=de